SCIENCE.

FRIDAY, AUGUST 21, 1885.

COMMENT AND CRITICISM.

THE ANNOUNCEMENT IS MADE in another column, by Dr. C. S. Minot, that Mrs. Elizabeth Thompson of Stamford, Conn., has given to a board of trustees the sum of twenty-five thousand dollars "for the advancement and prosecution of scientific research in its broadest sense." It is a generous gift for a noble purpose. With a degree of wisdom which is fortunately more and more evinced by those who make endowments, the methods to be employed for the accomplishment of these ends have been left by the donor to the judgment of those whom she intrusts with the fund. They are men in whom the public will also have confidence. One of them is a physiologist, one an astronomer, one a political economist, and one a biologist. The income will soon be available; and the founder may hope to see within another year good work in progress, which her liberality has made possible.

It has been suggested that the fund thus established should be administered by an international association of science, if such a body is initiated by the British and American associations. This would doubtless give *éclat* to the new organization, but diffused responsibility is by no means essential to the success of the fund. A small body of trustees, such as that now instituted, is quite adequate to the direction of the project, particularly if its endeavors and its results are made known to the public by annual reports, which may evoke the comments and suggestions of other scientific men. But whichever form of direction may be finally adopted, the far-sighted and generous gift will be everywhere recognized as deserving the gratitude of all who believe in the progress of science, and the endowment of research. We welcome as a new agency in the promotion of knowledge, 'The Elizabeth Thompson science fund.'

WITHIN A FEW YEARS a change has been effected in the organization of the American association, through a considerable increase in the number of its sections. In its present composition, it resembles much more than formerly its prototype, the British association. The change was a necessity of the immense recent growth of our association. There is another desirable change, not so radical, but in its future significance quite as important, which would be in keeping with the example of the British association, and which, even if entirely within the province of the standing committee to carry into effect, should receive the countenance of the members at large. This concerns its annual volume of proceedings. Means of publication have now so vastly increased in all parts of the country, that there is no longer need of this one additional channel of communication with the outer world; and the publication in full of all the papers read at any meeting (which has never been attempted in recent years) would absorb at once all the increasing income of the association. A considerable number of the papers are printed only by title, most of the remainder only by abstract; but the abstracts are apt to be of undue length, and a considerable number of papers are printed in extenso.

The change which we would advocate is, that *all* papers should be printed in the 'proceedings' either by title, or by brief abstract only. Should any papers prove of such exceptional interest that they should be printed in full (and desirable, as would then be the case, that they should appear under the auspices of the association), it is also manifestly important that they should be published by the association without delay; which, under the

present arrangements, is impracticable, as no volume of proceedings has been issued in recent years under ten or eleven months. This year it is twelve. Let such papers then be printed in quarto form under the title of 'memoirs' (a series already commenced), and issued one by one as fast as printed: even with this elimination and restriction, the volume, with the growth of the society, will become quite as large as should be issued by the association with its limited funds and its liberal rules of distribution. The members would receive an acceptable *quid pro quo*, containing a fair statement of the work of the association and the industry of its members. Such an action would, as it should, elevate the presidential addresses to a higher dignity; while, more important than all, it would free the association from a heavy monetary burden, and enable it, as it otherwise could not, to devote a not unimportant part of its annual receipts to annual subsidies for special research. The association would thus be enabled to take the place that belongs essentially to it — of fostering 'the advancement of science' in the most effective manner.

ANOTHER EVIDENCE of the necessity of restriction, in expenses of astronomical establishments, comes from abroad. In his last report, Admiral Mouchez, director of the Paris observatory, noting the fact that the publication of the *Bulletin astronomique* entails great outlay of the resources of the observatory, expresses his apprehension, that, unless the list of subscribers to the periodical is largely augmented, the journal must soon be discontinued. *Bulletin astronomique* is a monthly of the highest value; and, although very young, it would be greatly missed. The first number was that issued for the month of January, 1884.

LETTERS TO THE EDITOR.

**** *Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Meteoric activity, Aug. 10.

ON the 10th of August last, the date of meteor activity, it was noticed about ten o'clock in the evening, that meteors issued very frequently from the constellation of Perseus. They increased in number hourly, until about two o'clock in the morning they attained their maximum frequency, which was about one hundred and fifty every hour. After this the number per hour grew less frequently until four o'clock in the morning, when they fell, as in the early evening, about fifty each hour. The majority of meteors were of the third and fourth magnitude, and from two to three degrees in length. The finest meteor of the evening issued from the constellation Perseus, took a north-westerly course, and disappeared behind the horizon. It was of the first magnitude, and silvery in color. The passage of the meteor was marked by a train resembling steam, which did not disappear for over a minute. Many other meteors were observed during the evening, but all were less brilliant than the one described. Two were seen directly south, and a few south-west; but the majority issued from the constellation of Perseus.

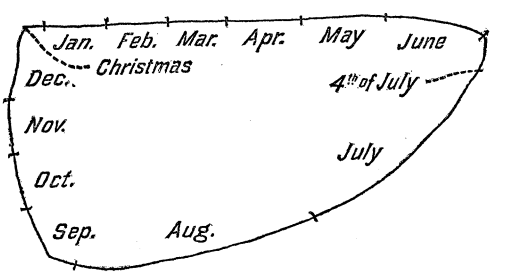
DARWIN MYERS.

Fort Wayne, Ind.

Color associations with the months.

Noticing in *Science* of July 31 a letter on 'color associations with the months,' I would call attention to a geometrical association that I have unconsciously acquired, and that is ever present in my mind when thinking of any date, or period of the year. The curve is represented in the subjoined sketch. The divisions represent months. Several, as you observe, appear longer than others. The plane in which this curve is described appears to me inclined at an angle of about 40° with the vertical. Its longest diameter is perhaps two hundred yards. From day to day I seem to move along this imaginary line to positions corresponding with the date.

Notable days, as Christmas and Fourth of July, stand out as distinct marks in the curve. It appears, not as a black line, but as a portion of space only

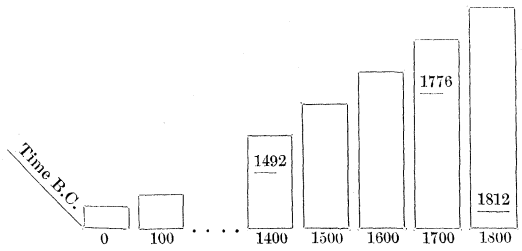


defined by marks here and there denoting days on which something occurred that I remember. My supposition as to the origin of this unnatural and rather unpleasant notion of the months, is, that, when a child at school, the impression made upon my mind by my every-day duties was similar to the emotions one would feel in walking around a curve arranged as this is. Entering school the middle of September, there was, until Christmas time, hard, up-hill work. Then for one week, until Jan. 1, a period of rest, after which things would go easier by my being accustomed to them, and looking forward to the spring. During June the curve begins to bend down; and, through July and August, there is perfect rest, as though one were sliding down with no exertion, until towards September the thought of again assuming the duties of school-life puts a stop to the downward motion, and the curve begins to ascend in September. On this supposition it is hard to explain why July and

August are so much longer than the other months. This impression of the months applies only to the current year.

When thinking of any event that occurred more than one year ago, I have an entirely different scheme presented. The second figure illustrates it. The centuries are arranged in columns, decreasing in length until the Christian era, beyond which the lapse of time is denoted by an inclined line here shown.

Important dates I think of as lines crossing these columns; and the life of a noted man, or a war, as the space included between two such lines.



I should have said, that in these columns the decades are marked by especially distinct lines. It seems to me there is in these mental associations a large and interesting field for study; and I, for one, would be glad to hear other facts bearing on the subject.

C. RUHEIT.

New Haven, Aug. 6.

The classification and paleontology of the U. S. tertiary deposits.

In the issue of this journal of June 12, Prof. A. Heilprin condemned the second part of my article on the genealogy of the tertiary mollusca of the United States *before* it had been published. Since its appearance, moreover, he has again recurred to the subject in a note in *Science* of July 31. I would here beg permission to defend myself from the charges that he brings forward.

I have shown that the literature affords no evidence, either paleontological or stratigraphical, that the Vicksburgian is the most recent formation; and have given a number of reasons, based upon profiles which I have observed, showing that this bed is most probably the oldest. Professor Heilprin, however, has nothing whatever to say on these subjects. What, then, does he say?

1. "It might appear . . . that the paleontological evidence was in conflict with that derived from stratigraphy. As a matter of fact, however, the paleontological evidence . . . is, as we now know it, absolutely confirmatory of the pregnant facts which the stratigraphy of the region presents; and, indeed, it would be difficult to find a region of similar deposits where it is more so." When he wrote this, Professor Heilprin must have entirely forgotten what he himself had published on the fossils from Wood's Bluffs, (Proc. ac. nat. sc. Phil., 1880, 364–375). There he points out, in spite of certain wrong determinations, clearly and in extenso, the conflict between paleontological and stratigraphical evidence (see pp. 368, 369).

2. "The absence or scarcity of forms of a distinctively old-type facies in the Vicksburg beds, and the introduction there of new forms whose equivalents or immediate representatives are known only from the newer horizon, are sufficient in themselves to establish the position." This statement of Professor Heilprin is new and wholly without proof. My studies lead me to precisely the opposite view. In the Vicksburgian are contained the old forms, while in the Claibornian the new ones make their appearance. The facts upon which I base this statement will be given in another place.

3. I have contested the right to consider and map all localities with Orbitoides as oligocene. Professor Heilprin objects to the older authorities, hence I will here quote the following very recent one. Zittel's Handbuch, vol. i., Munich, 1876–80, p. 103, says, "Orbitoides . . . In der obersten kreide, sehr verbreitet im eocän, im miocän selten." If Professor Heilprin can cite any authority, stating that Orbitoides occur only in the oligocene, I shall be very glad to have him do so.

4. Then Professor Heilprin speaks of Zeuglodon. He argues, Zeuglodon is 'leitfossil' for the Jacksonian; it is known in Europe in late eocene or miocene deposits, hence the inference is that the Jacksonian must be late eocene (or miocene?); the Claibornian is middle eocene (Parisian), consequently the Jacksonian overlies the Claibornian. To give to this argumentation some weight, it will be necessary for Professor Heilprin to prove: *First*, That Zeuglodon occurs only in the Jacksonian, and not elsewhere in America. Having studied the known *facts* which have been published, and having myself seen and collected Zeuglodon at different localities in the South, I have as yet not found evidence to convince me of the truth of this statement. *Second*, That he has a right to parallelize the Jacksonian with any European bed from the presence of a single genus. I found a small bivalve in Jackson, which I should compare with specimens of the genus Kelliella, Sars. If, however, a genus (not a species) can be determined from figures and descriptions alone, there can be no doubt that this fossil belongs to this genus, hitherto only known as recent (and pliocene?) in Europe. Has any one a right to draw from this the conclusion that the Jacksonian bed is recent or pliocene? *Third*, That the Claibornian is middle eocene. My studies and comparisons have demonstrated to me that it would be a laborious and difficult task to parallelize the sub-divisions of the American old-tertiary with those of the European. So far as I am aware, my material for this purpose exceeds that of any other collection. Hitherto I have ascertained nothing to prove that the Claibornian is middle eocene, although it may yet be proved. If Professor Heilprin can prove two of these three-mentioned points, without the third one, there will be nothing convincing in his argument 'to the mind of any unprejudiced paleontologist.'

5. "In that which relates to the oligocene (Orbitoide, Nummulite) rock of Florida, whose existence appears to give Dr. Meyer a considerable amount of anxiety, and which would better suit the requirements of the new theory were it cretaceous, our author need entertain no doubts. The rock is there," etc. I have not the least doubt about the existence of orbitoidic limestone in Florida, observed by E. A. Smith, nor have I anywhere expressed such. This limestone causes me no anxiety whatever. I fail to see why this limestone, if Vicksburg is the oldest bed, should be cretaceous. I have nowhere expressed this belief, nor do I think it will prove to be of this formation. All that I have said is, that there is no reason to map as oligocene localities where orbitoidic limestone is observed, or the larger areas, where nothing at all has been observed.

6. "In such inquiry, it is necessary, however, to

know the relative positions of the different deposits with which one is dealing, and not to proceed, as Dr. Meyer has done, from top to bottom, believing that top was bottom, and bottom top." Professor Heilprin has confounded the limestone at the top of the profile in Claiborne with the limestone at the base, because he has studied the literature regarding it superficially, and because he himself has never seen it in nature. If he puts no faith in the observations of Conrad, Lyell, or my own, he may go there and observe for himself.

7. I fail to see what the fact, that Professor Heilprin has been six years curator of the tertiary shells in Philadelphia, has to do with any conclusion which I have drawn, based upon my larger material. It may be that he has studied these shells attentively; although I have pointed out paleontological mistakes of a surprising nature in his publications on tertiary fossils, and although I had published my regrets that he had not utilized the Philadelphia type-specimens for the benefit of science. The fact, that he once sent me an undescribed tertiary form of the collection as a duplicate in exchange (see 'Terebra trilirata Conr.,' *Proc. ac. nat. sc. Phil.*, 1884, 105, 106) makes me doubt whether this study was as thorough as he intimates.

8. "Pseudo-science, of the kind to which we are here treated, should be exposed." After having worked for years in the old-tertiary formation in Europe, I studied the literature of the corresponding formation in America, following the different opinions from their origin, and tracing out contradictions. Then I went to the spots, observed for myself, and from all these studies I have been forced to conclusions, which, indeed, throw a peculiar light on some publications. Professor Heilprin's way has been to study the literature, and then to write a book on this formation: even to map it, without ever having seen it. He calls *my* way 'pseudo-science!' Without having pointed out one single mistake in my papers, Professor Heilprin uses the expressions, — "geological and paleontological fancies . . . monstrous disregard or ignorance (or both) of the literature . . . misconception of the numerous species . . . vagaries . . . amusing . . . pseudo-science," and warns paleontologists not to accept my species.

I have here fully answered Professor Heilprin's objections, in order to show his method of argumentation, and how useless and how disagreeable discussion with him is. I will not, however, enter into any further controversy with him upon this subject; at all events, not until he has made some examination of the region under consideration, in person, and then confines himself strictly to the discussion of observed facts.

OTTO MEYER.

New Haven, Conn., Aug. 12.

A NEW ENDOWMENT FOR RESEARCH.

IT is usually the case that private endowments for public purposes are made subject to narrowing restrictions, and then it too often ensues that with the lapse of time the very object of the gift is defeated by the restrictions: the letter kills the spirit. It must therefore be a matter of congratulation when a great public donation is left as free as compatible with the general object for which it is made. This is remarkably the case with a noble and munificent endowment established by Mrs. Elizabeth Thompson of Stamford, Conn., an American lady well known for her public benefactions. Her long experience with churches and various charitable enterprises had led her to question whether the money spent in them achieves the greatest possible good. She finally reached the conviction that knowledge is the real source, the impelling power of human progress; and it became her desire, from motives of the highest philanthropy, to contribute to the promotion of science.

When the plan for the establishment of an International scientific association was brought forward at Montreal, and again at Philadelphia, before the great national associations, Mrs. Thompson considered that the proposed international society would be the fittest body to assume the trust she wished to establish. Accordingly she placed in my hands the sum of five thousand dollars as the nucleus of a fund to be controlled by the International scientific association when organized.

Not long since, Mrs. Thompson communicated to me her desire to transfer the above-mentioned sum to a board of trustees, and to add to it at once twenty thousand dollars more, making a total permanent fund of twenty-five thousand dollars. Mrs. Thompson has been as liberal in the conditions she has established as in the amount she has given. According to her letter of conveyance, "The income of the fund is to be devoted to the advancement and prosecution of scientific research in its broadest sense; it being understood that to provide for, and assist in, the maintenance of an international scientific association, is a method of application which seems to me very desirable."

The trustees are left with very great discretionary powers, which are to be guided by certain general directions. It is, above all, expressly understood that the prime object is to contribute from the income towards defray-

ing the cost of scientific researches. The board of trustees consists of five members: Dr. Henry P. Bowditch, chairman; William Minot, jun., treasurer; Prof. Edward C. Pickering; Gen. Francis A. Walker; and Dr. Charles S. Minot, secretary. It was considered important to have as great a variety of interests represented as possible, and this is accomplished by the association of the above gentlemen.

When the International association is organized (and it is hoped that the movement will be initiated by the British association at Aberdeen), the income of the fund will presumably be expended under the direction of that new association; until then, under the direction of the trustees. The first appropriation will probably be made next autumn, when several hundred dollars will become available. At the proper time a circular will be issued, announcing the manner in which applications may be made. As it is desired to give the fund an international character, it is hoped that foreign journals will copy this notice.

In conclusion, I wish to express my admiration for the wisdom shown by Mrs. Thompson. It is certainly very remarkable that a person not especially versed in science, nor directly interested in any of its branches of investigation, should be induced by a desire to benefit her fellows, not to give for some temporary need, but, with exceptional insight, to give for the development of the very sources of progress. The same sound judgment governed her decision as to the conditions of her gift, for it is difficult to foresee any probability which will render this endowment futile. Very often the object of a public gift is determined by the donor's personal interests. I believe Mrs. Thompson was governed by her convictions as to the application of her money which would do most good. She is a devout person, and trusts in the peaceful union of true religion and true science.

At their first meeting the trustees voted unanimously to call their trust 'THE ELIZABETH THOMPSON SCIENCE FUND.'

CHARLES SEDGWICK MINOT.

THOMAS ALVA EDISON.

THOMAS ALVA EDISON was born at Milan, Erie county, Ohio, on the 11th of February, 1847. His ancestors on his father's side were of Dutch descent, having emigrated from Holland to the United States in 1730. His mother, Mary Elliot by name, though a native of Massachusetts, was originally of Scotch parentage. She had for some years taught in a Canadian high school, and was possessed of an excellent education. Under her careful training, her son, in the almost entire absence of the ordinary educational privileges, developed very early a fondness for books, which became almost a passion. Before he was ten years old he had read not only Newton's 'Principia' and Ure's 'Dictionary,' but also Hume's 'England,' Gibbon's 'Rome,' D'Aubigné's 'Reformation,' and Burton's 'Anatomy of melancholy;' and at the age of twelve he undertook the task of reading through the public library of Detroit in course, becoming convinced, after wading indiscriminately through fifteen feet of shelving, that it would be better for him to make a selection of works upon his favorite subjects.

In 1854 the Edison family removed to Port Huron in Michigan, and a few years later young Edison became a train-boy on the Grand-trunk railway. When the line was completed between Port Huron and Detroit, he secured the exclusive right upon it as news-agent, employed four or more assistants, fitted up a printing-office in the baggage-car, and issued therefrom a weekly journal called *The grand-trunk herald*. While thus occupied, he became interested in telegraphy; and having, at the risk of his own life, saved a little boy from being crushed under the train, the father, a station-master upon the road, assisted him to become an operator. So assiduously did he apply himself, practising often the entire night, that at the end of five months he was given in charge the telegraph-office at Port Huron.

As a telegraph-operator his career was a checkered one. He was employed chiefly for night-work in positions of increasing importance, until finally he reached the larger offices of Indianapolis and Cincinnati. Everywhere his desire for information, his originality in suggestion, the novelty of his speculations, his exemplary conduct, and his uniform good nature, won for him the regard and esteem of his associates. In 1864 he went to Memphis as a government operator; and thence he removed to Louisville, where he remained two

: wrote and printed a book
He also experimented to de-
e of penmanship for telegraph-
ng finally a slight backhand,
nd letters apart from each
aded, attaining himself by its
of forty-five words a minute.
operated in Cincinnati again,

moved from there to Boston, where he was put in charge of a heavy wire to New York.

It is as an inventor, however, that Edison is best known in the community. His first invention was an automatic telegraph-repeater, and was made in 1863, while an operator in Indianapolis, though it was not put into practical operation until some time afterward, at Memphis. It was while operating at this latter place that the possibility of duplex transmission occurred to him. And although the instruments required to test his method were constructed while he was in Cincinnati, it was not until 1870 that they were actually tried upon the line. On reaching Boston, he found an appreciative friend in Mr. Milliken, under whose active encouragement his inventive talent rapidly developed. He devised a dial or indicating-telegraph for local lines, a chemical-recorder for voting purposes, and a private line-printer, experimenting at the same time, between Boston and Portland, on vibratory telegraph-instruments.

His experiment on duplex transmission was made between New York and Rochester, and proved unsuccessful. Penniless and disheartened, he went to New York in search of employment. Chancing to be in the office of the Gold and stock company when a serious breakdown of their apparatus occurred, the officials, in despair, allowed Edison, then unknown to them, to try his skill upon it. His success showed his ability, and he was at once given an important position. Soon afterward the Western union telegraph company and the Gold and stock company entered into a joint agreement with Edison, by which he bound himself to give them the first refusal of all his inventions relating to telegraphy. Thereupon he opened an extensive shop at Newark, and entered upon a period of experimentation and invention. Here he toiled arduously by day and by night, having upon his hands at one time, it is said, no less than forty-five different inventions and improvements in process of development. The constant strain thus put upon him overtaxed his strength. He gave up manufacturing altogether, and in 1876 removed to Menlo Park, where he built and equipped an experimental laboratory, and devoted himself entirely to investigation. From this laboratory most of the inventions have issued which have made Edison so well known.

Up to the present time, Edison has taken out in this country about four hundred patents, — a fact which shows most clearly the prolific character of his mind. Of these, not far from one-fourth relate to telegraphy, — chemical, au-

tomatic, acoustic, duplex, quadruplex, sextuplex, printing, fire-alarm, district, and domestic; about the same number have reference to electric-lighting; while the remainder refer to the telephone, the electric transmission of power, the electric pen, and other miscellaneous inventions. Among all these, perhaps the most remarkable are the quadruplex telegraph, by which two messages may be sent simultaneously in opposite directions from each end of the line; the automatic telegraph, which can transmit a thousand words a minute; the motograph relay; the carbon telephone; the Edison system of electric-lighting by incandescence; and the Edison electric railway.

Besides his inventive talent, Edison possesses marked ability as an investigator. He discovered independently the variation in resistance produced in semi-conductors by pressure; utilizing afterward this fact in the construction of his transmitting telephone, his tasimeter, and his telephone relay. He first observed the curious fact that the passage of an electric current between a metallic and a moist semi-conducting surface varies the friction between these surfaces, — a phenomenon supposed at first to be electrolytic, though now believed to be electro-capillary. This fact he at once applied to practical use in the motograph relay and the loud-speaking telephone. While experimenting with platinum for the purposes of electric-lighting, he observed that this metal occluded an enormous amount of gas, and noted the remarkable fact that the fusing-point of the metal rose as this gas was expelled; so that a platinum coil, after long-continued treatment at a high temperature in a vacuum, could be made to give many times as much light as a coil of the untreated metal. Hence he propounded the theory that the annealing process consists in the expulsion of the occluded gases by heat, thus leaving the metal more or less porous, and therefore soft and flexible. The various phenomena which he has observed in his incandescent lamps are of great scientific interest. In the first place, these lamps are of exceptional efficiency as condensers. In the second, the Crookes effect is very marked in them, and is equally curious, whether we explain it on Edlund's assumption that a vacuum is a conductor, or on the more probable hypothesis of Rowland, electrical transference by convection. More surprising still, perhaps, is the fact of the ready passage of the current through the glass of these lamps, as proved by him, even at the base, where the glass is not heated.

Of all his discoveries, however, that of the phonograph has undoubtedly given him the widest general reputation. The extreme simplicity of the apparatus by which the tones of the human voice could be recorded, and afterwards faithfully reproduced, excited great interest, not only among the masses, but also in scientific circles, since it promised to be a valuable instrument for the investigation of articulate speech. His latest contribution to science, a photometer containing an accurate standard of light, bids fair to add equally to his well-earned reputation. These facts, among others that might be mentioned, are quite sufficient to show Edison's acuteness as an original observer, and to establish his capability in the direction of independent research. It is much to be regretted that want of time, and a decided distaste for the manual labor of putting his thoughts upon paper, has prevented him hitherto from placing his discoveries on permanent record.

The exhibit made by Edison in 1881 at the Electrical exhibition in Paris was a most interesting one. On both sides of the ocean he had been severely criticised, and often abused, for views held to be chimerical and absurd. At very considerable trouble and expense, therefore, he prepared an elaborate collection of apparatus illustrating his inventions, including many articles of great historic value, and sent them to Paris, in order, as he said, to prove whether or not he had made original discoveries and inventions. The extreme ingenuity of these devices, the thorough knowledge of scientific principles everywhere shown in them, and the great electrical and mechanical skill evident in their construction, won for him, unsolicited, the most complimentary encomiums, and secured without opposition the highest award within the gift of the jury.

In person, Edison is of medium height, rather stout, and quite informal in manner. His face is clean-shaven; his hair dark, with here and there a tinge of gray; and his eyes brown, deep-set, but sharp and clear. A slight deafness gives him a rather absent, and sometimes listless air, which disappears at once, as soon as he becomes interested in conversation. In his experimentation he is minute and painstaking, noting carefully the phenomena he is investigating, and recording accurately the results. Moreover, he is not only quick to observe facts, but prompt to detect their practical importance, and ready to seize upon such of them as may serve as the basis of an invention. His mode of living is extremely simple. In his manners and way

of life, he is far removed from any thing approaching assumption or conventionality. His disposition is amiable and retiring. He is now in the full vigor of health, and, at the age of thirty-eight, finds himself in possession of a well-earned and solid reputation. Should that long life — which seems to be a legacy in his family — be vouchsafed to him, very much more of discovery and invention may be looked for from him as the result of his maturer thought and larger experience.

THE ELECTRIC RAILWAY IN NEW YORK.

For several years past, the question of running the New-York elevated railroads by electricity has been agitated. This culminated in a meeting held in New-York City on the 18th of November, 1884, at which were present representatives of the Edison, Daft, Field, Siemens, Brush, and Bently-Knight electric railways, and also of the New-York elevated railway. At this, and five subsequent meetings, it was decided to test each system of applying electricity as a motive power for railways upon a certain portion of the elevated road. To pass judgment as to the relative values of the various systems, the following gentlemen were appointed to form a board of arbitrators: Sir William Thomson, Prof. Charles R. Cross, George B. Roberts, James H. Rutter, and Robert Harris. It was, moreover, decided to finish the test, if possible, within ninety days. This time has long since elapsed, and the waiting public have heard no report.

During this time, however, a vast amount of work has been done, and great difficulties surmounted. The great delays have been occasioned by the mechanical application of the electric-motor to the heavy and quickly moving trains. In the various systems to be tested, a third rail will be employed; and the laying of this, combined with its proper insulation, has consumed a vast amount of time.

In spite of all difficulties, the Daft company have completed their preparations, and are ready to start. As in other systems, the electric circuit is made from the dynamo to the central rail, through the collector to the motor, thence to the wheels and rails, and back to the dynamo. This company have laid their third rail upon the Ninth-avenue line, commencing at 14th Street. This rail is insulated by the Daft patent insulator, which prevents water from making a connection from rail to sleeper, thus insuring good insulation in all weathers. The road is further equipped by completing the electrical contacts at the joints of the outer rails.

At the end of this line the company have located their central station. They have placed in position a large William Wright engine, with the necessary boilers and shafting. Two fifty-horse-power Daft dynamos are now in position, and, later, a third will be erected to relieve the others, in case of accident. The wires are carried from the station to the rails through the streets upon poles.

The motor, Benjamin Franklin, has been for some weeks finished, and has been thoroughly tested. The motor is fourteen feet six inches long, and six feet nine inches wide, and weighs nine tons. The schematic drawing (fig. 1.) will show the manner in which the motor is arranged. No attempt is made here to reproduce the proportions of the Benjamin Franklin. One of the largest-sized Daft mo-

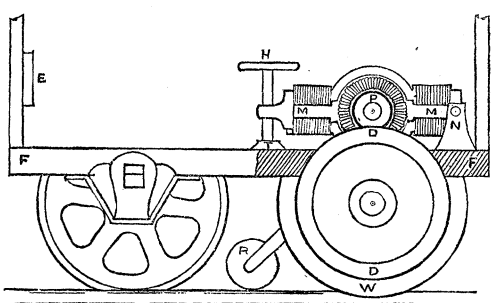


Fig. 1.

tors *MM*, is mounted upon the truck *FF*. The motor is hung so that it turns about *N* as an axis. The other end is supported by the screw *H*. The maximum capacity of this motor is three hundred ampères, with an electro-motive force of a hundred and eighty-five volts. The power is transmitted from the motor to the wheels by the grooved friction-gearing *P* and *DD*. *P* is keyed to the armature shaft, and *DD* to the drive-wheel shaft. The flange of the drive-wheel, on the farther side, is shown at *W*. These gears are duplicated on the other side of the motor. The amount of pressure upon the friction-gears is regulated by the screw *H*. This screw is also advantageous in case of repairs, for by means of it the motor may be moved completely off its friction bearings. The support *N*, of one end of the motor, is cushioned with heavy strips of rubber, as is also the cap *T*, upon which the screw rests. The trucks are likewise cushioned, thus allowing freedom of motion in any

direction, and insuring perfect accommodation, on the part of the motor, to any irregularities in the road-bed.

The connection with the middle rail is made by means of a heavy bronze wheel fourteen inches in diameter *R*. This being fastened to an arm, may be raised or lowered, thus allowing discontinuities in the central rail, of which there are several in the Ninth-avenue line, to be safely passed. The wiring is all underneath the frame, and is enclosed in wooden sheathing. The device for controlling the motor is placed at the end of the cab at *E*. This is a device of sliding contacts, worked by a handle similar to the throttle in the locomotive-cab, which raises or lowers the resistance in the field-magnet circuit, thus varying the amount of current, and consequently the strength of field and speed of motor. There is also a complete cut-out in circuit. The motor is thus under complete control, it being possible to run fast or slow. The motor may be stopped either by the cut-out, or by lifting the contact-wheel. The system is further provided with an automatic cut-out, which breaks the circuit when the current reaches a certain strength, at the same time ringing a bell at the central station, warning the engineer at the central station that there is trouble on the road.

The reversing-gear is simply four brushes connected by suitable links, so that a movement in one direction applies one pair of brushes, while a movement in the other applies the opposite pair. In the motor Benjamin Franklin, the ordinary hand-brake will be employed; but later, some form of air or electric brake will be used. This motor is a very substantial affair, as its weight (nine tons) would show. The experiments will be performed as soon as Mr. Daft is at leisure to commence them.

The Edison and Field companies have combined, and are preparing to test their system upon the Second-avenue line. The length of this line from Chatham street to Harlem is 7.44 miles, only part of which, however, will be traversed by the electric railway. Although this company have not brought their work so near completion as the Daft company, still they have done a deal of hard work. They have located their central station upon 24th Street, and have provided there a two hundred and fifty horse-power Whitehill & Smith engine, with the necessary boilers and shafting. The Edison dynamos have not yet been set in position, nor has any wiring been done.

In this system, the central rail has to be very carefully insulated on account of the comparatively high electro-motive force employed (some six hundred volts). To this end, the rails will be insulated by resting upon glass shoes, which will be protected from the jar of passing trains by a thin strip of rubber. As the glass shoes have not been delivered, the rails have not been laid.

The work upon the motor has progressed slowly on account of the many difficulties offered. The original arrangement shown in the *New-York world*, April 26, 1885, has given way to several newer forms suggested by it. The latest form, and the one to be completed, is shown in the schematic drawing (fig. 2).

In this system, every truck will be provided with a motor, thus making every car independ-

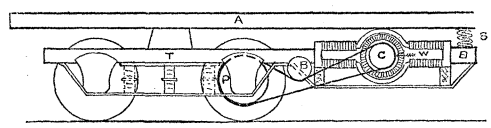


FIG. 2.

ent. In fig. 2, *A* is the bottom of the car, *T* is the ordinary railway truck used upon any car. To apply the motor, the truck is prolonged to *B*, and is supported by the spring *S*. This spring is hung from a roller capable of side motion, thus allowing the truck to accommodate itself to curves. The motor used is a compound-wound Siemens, and is so designed that, with an external electro-motive force of six hundred volts, it will revolve at a constant speed of six hundred revolutions per minute. The power is transmitted from the armature to the pulley *C* by means of a Weston friction-clutch. This friction-clutch *W* is worked by a wheel similar to the ordinary brake-wheel, one wheel working both friction-clutches of one truck. The power is transmitted from the pulley *C* to the pulley *P*, keyed to the axle of the driving-wheels by means of a heavy leather belt of peculiar construction. In order to obtain more bearing-surface for the belt, it is carried around the pulley *B*. This same arrangement is reproduced on the other side of the truck.

The motor itself is movable, so that the tension of the belt may be varied at will. The contact with the middle rail is made by means of brushes sliding upon it. The brushes are mounted on the ends of a bar which prevents their dropping down when another road is passed, and thus short circuiting the track. The brushes are held in position by springs which allow them to turn, and thus insures a drag of the brushes at all times, instead of

a push, thus allowing the joints in the rails to be smoothly passed. The reversing is accomplished as in the Daft, by employing an extra pair of brushes. The speed of the car will be controlled by the friction-brake, the motor running constantly at a uniform speed. The Eames vacuum brake will be employed, the pump of which will be run by the motor.

It will be seen from the above, that the Edison-Field combination are working upon a new principle. This system will have many advantages peculiar to itself. Each car will be independent, and the cars composing the train will start off simultaneously, thus relieving the elevated structure of the great strain caused by the locomotive when starting. The constantly revolving armature, on account of its high speed, and consquently great momentum, will help start the train, thus relieving the engine at the central station of sudden and great strains. As the load on the car increases, the traction likewise increases. The weight, moreover, of a train of this kind, is more evenly distributed than in one moved by a locomotive.

The electric motor, in general, possesses advantages which are of special value on an elevated road. It is possible to balance an electric motor, thus relieving the structure of the constant vibration caused by the quickly-moving locomotive. Its freedom from dust and smoke, as well as its economy, insure its immediate introduction.

Although the progress in introducing the electric motor on the New-York elevated railway has not been so rapid as had been anticipated by enthusiasts, still the progress has been steady, and in the right direction. It is, perhaps, remarkable, that more companies have not commenced operations; but when the magnitude of the task is realized, and the patents held by a few parties are inspected, the reason is seen. However, several other companies intend to commence operations in the immediate future, the plans of which are now maturing.

F. A. PICKERNELL.

A SCHOOL FOR ELECTRICAL ENGINEERING IN BOSTON.

THE wonderfully rapid advances which have been made during the past fifteen years in the technical applications of electricity have taken place at so swift a rate, that the progress of invention has frequently been such as to outstrip the technical knowledge necessary to apply its results successfully and economically on a commercial scale. Within the period mentioned, the arts of quadruplex and multiple telegraphy, telephony, electric lighting on a large scale, and the electrical transmission and distribution of power, have come into being, while an enormous extension has taken place in many of those branches which, like ordinary land and submarine telegraphy, have been practically successful for a longer time. And almost simultaneously with this development of the practical applications of electricity, and largely on account of it, has come a correspondingly rapid and important development in electrical theory, and in the construction of accurate instruments for electrical measurement; so that engineers with an electrical training limited to the small amount which, until recently, was all that could be obtained in our colleges and scientific schools, have found themselves ill prepared to deal with the problems forced upon their consideration. In fact, a new profession, that of electrical engineering, had suddenly opened, and neither the civil nor mechanical engineer was well prepared to pursue it.

Up to the summer of 1882, no adequate provision appears to have been made by our scientific schools for the technical training of young men desiring to enter this profession; but at that time the Massachusetts institute of technology, recognizing the need of such instruction, decided to establish a course leading to a degree in electrical engineering. This course has gradually been brought to a state of completeness, until at the present time, besides a few who have very recently graduated, there are about fifty students who are pursuing it.

The course requires four years for its completion. During the first year the time of the student is occupied with general preparatory studies in mathematics, chemistry, drawing, and the modern languages; and no one is allowed to enter upon any of the professional work of the later years who has not done very creditably in the two first-mentioned studies. The professional work, which extends through the three remaining years, is based upon a thorough study of general physics, mathematics, and mechanical engineering. The theory of electricity, and practice in electrical measurements, are pursued simultaneously in the lecture-room and laboratory, the student learning the use of the different forms of apparatus ordinarily used in electrical testing. A knowledge of the calculus, and of analytical and applied mechanics, is assumed in the professional studies of the course; and works of reference, or, if desirable, text-books written in French and German, are freely used. A very con-

siderable portion of time is given to certain branches of mechanical engineering; so that, by his work in the laboratory of mechanical engineering, the student becomes familiar with the theory and practice of the steam-engine and other motors, and acquires skill in the use of the indicator and the different forms of dynamometer, and also takes part in numerous boiler and engine tests. He thus gains a knowledge, which, in case he enters upon any application of dynamo-electric machinery, will be very important to him.

Throughout the last year an extended course of lectures is given upon the technical applications of electricity, in which the theory and practice of telegraphy, both land and submarine, telephony, electric lighting, and the electrical transmission of power, are discussed. In order to add to the value of this course, the lectures and laboratory exercises given by the regular teachers of the school are supplemented by instruction from various gentlemen who are professionally engaged in the practical development of electrical science, who give courses of lectures, or single lectures, upon special subjects; so that the student has the opportunity of learning exactly what is considered as good practice among those actually employed in the profession which he has chosen.

In any course of this nature, very much depends upon the facilities which are furnished in the way of instruments for precise measurement. The importance of a proper supply of such apparatus has been recognized; and the Rogers laboratory of physics, in which the experimental electrical work is carried on, is well supplied with the necessary facilities. For line-testing, the student has access to actual telegraph-lines, and learns the methods of working most suitable for such purposes. Also an experimental study is made of dynamo-electric machinery, electrical motors, electric illuminating apparatus, and other similar appliances. The student is further required to undertake a certain amount of work of an original nature, and is thus stimulated to enter upon scientific research. A well-selected reference library, containing most of the physical and electrical journals, together with the leading works on these subjects, is accessible at all times.

The aim of the course, as a whole, is to give an education in which theory and practice shall go hand in hand. The pupil is taught, that, as science advances, the two become more and more closely allied; so that his professional success will be most probable, if, to as thorough a knowlege of theory as he can acquire in the four years of his undergraduate study, he adds a large amount of practice in the application of his theoretical knowledge to the solution of the problems with which the electrical engineers of the present time are especially concerned. And an attempt, at least, is made to give him such a preliminary training, that he will find himself well furnished with the necessary knowledge to continue his studies by himself, as opportunity may afterwards be furnished, or occasion require.

ELECTRICAL MEASURING INSTRUMENTS.

FOR the quantitative determination of an electrical current, any one of its effects may be employed, the law of which is known; and the choice of the effect to be utilized in the construction of a measuring instrument will be influenced by different considerations in different cases. The requirements of the practical uses of electricity necessitate, in general, instruments capable of measuring currents of great strength, varying through a wide range. The instruments must unite the characteristics of compactness and portability with simplicity of mechanism and manipulation, thus excluding many of the methods available in the permanent physical laboratory. The devices which have been employed are so various, and the forms of apparatus so manifold, that a mere catalogue of them would reach beyond the proper limits of an article. As they naturally fall into a comparatively small number of groups, however, the leading characters of certain typical forms may be indicated within a moderate compass, and the merits or defects of some of the more prominent pointed out.

The most common and obvious method of measuring an electrical current depends upon the deflection of a magnetic needle by the current itself. The simplest arrangement would be to use a straight vertical wire situated in the meridian of a very short magnetic needle, and at a moderate distance from it. Within certain limits of approximation, the tangent of the angle of deflection is proportional to the current strength. If the distance of the needle from the wire is made variable, an empirical scale can be experimentally formed, from which, in subsequent use, the current strength may at once be known from a single observation of deflection, the horizontal component of the earth's magnetism being supposed invariable, or its variation determined and allowed for in the reduction. In a permanent installation, such a plan would be feasible, and capable of giving useful results. But it involves some practical difficulties, the most prominent of which are the considerable length which must be given to the wire, and the fact that the wires bringing the current to the vertical portion of the circuit would themselves produce a disturbing effect upon the needle, unless particular

dispositions were made to render them inoperative. The chief recommendation of this method is, that its mechanical execution is so extremely simple as to be within the reach of even an unskilled mechanician. Of course this contrivance entirely fails to meet the requisite of portability.

If the conducting circuit is bent into a circle, and the needle placed at its centre, we have the tangent galvanometer, which may be regarded as the fundamental type among electrical measuring instruments. As in this case, the tangent of the angle of deflection is proportional to the current strength; with a great increase in the magnitude of the latter, the angle becomes too large for accurate measurement, owing to the rapid variation of the tangent for large angles. This difficulty can be obviated by increasing the radius of the circle; but the instrument then becomes gigantic and unwieldy, and is no longer portable. Increasing the strength of the magnetic field is another remedy; and another still is found in increasing the distance of the needle from the circle upon a scale calculated from the theory of the instrument, and verified or corrected experimentally.

The last two devices are employed in Thomson's current galvanometer and potential galvanometer. In these, the coil is made of comparatively small dimensions, as is the whole instrument, rendering it very portable and convenient to use. A semicircular magnet placed over the coil gives a very intense magnetic field, diminishing the deflection of the needle to a suitable value when powerful currents are used; while the compass-box can be moved away from the coil along a graduated scale. These arrangements give the instruments great range in their indications; but as the intensity of the curved magnet is easily affected, they require constant verification. In a laboratory this is very easy, and the apparatus is admirably suited for a variety of applications; but its delicacy, and the need of constant oversight, render it unsuited for rougher work.

Various other methods may be resorted to for increasing the range of the tangent galvanometer. Shunting is a practical and useful device, if care is taken that the shunt is so placed, or so far removed, as not by itself to deflect the needle, or affect the intensity of its field. The current may be passed through another parallel circuit of smaller radius, so that only a differential effect is produced upon the needle by the two portions of the circuit, as has been done by Brackett. Or the coil may be made to turn about a horizontal axis, as in the cosine galvanometer of Trowbridge, re-invented later by Obach.

As in all these instruments, the effect upon the needle is dependent upon the intensity of the magnetic field; and this is usually that of the horizontal component of the terrestrial magnetism: the variation in this may occasion considerable errors unless its value is constantly and accurately known; and there is also the liability to the intrusion of foreign magnetic forces from the circuits and magnetic masses in the neighborhood, a cause of error which is by no means imaginary in practical cases.

A second class of instruments dispenses with the needle, and utilizes the action of a fixed circuit upon a movable one, which is traversed either by the main current, or a shunted portion of it, or an independent current which can be varied or controlled. One of the simplest forms consists of two circular parallel circuits, either single, or consisting of many turns, one of these circuits being freely movable. The strength of the current is then directly proportional to the force required to keep the circuits at a fixed distance apart. This has the important advantages of entirely avoiding the use of magnets, and of equal applicability to steady, variable, or alternating currents. While disturbing magnetic effects are not entirely excluded, they are not usually of serious import. No practical and compendious apparatus embodying this principle is in general use, though it has been employed with success in Hill's dynamometer. Further experiment in this direction seems desirable. The various forms of dynamometer in use generally have the movable circuit mounted, so as to turn about a vertical axis, like the needle of a galvanometer, the strength of the current being computed from the angle of deflection, or read from an empirical graduation. In Siemens's form, however, the movable coil is brought into a fixed relation to the stationary one, by torsion, the amount of which measures the force exerted by the current. But this necessitates constant manual control, and fails to meet one important requirement in such instruments, — that they shall give their indications both directly and continuously.

Another mode of avoiding the use of a magnetic needle, is illustrated by those instruments which employ the pulling action of a helical current upon a rod of soft iron in its axis; and of these there are very many forms. The volt-metre and ampère-metre of Kohlrausch have the core in the form of a thin tube of soft iron for lightness, suspended by a rather delicate spiral spring of many turns, similar to those used in Jolly's specific-gravity balance. The iron tube is closed at the top, and hangs over a cylinder of non-magnetic material, which is fixed in the axis of the coil, and is of such a size as to leave a narrow annular space between it and the iron. The air confined within the tube thus acts like the liquid in a dash-pot, but more freely, and damps the vibrations of the tube and spring very effectually. An index attached to the side of the iron tube moves in front of a vertical scale, one side of which is graduated experimentally to volts or ampères, the other in millimetres. The zero-point is readily adjusted by means of a sliding-rod and set-screw, from which the spiral spring is hung. The two instruments differ merely in the winding of the coils, the volt-metre having many turns of fine wire, with a very high resistance; while the coil of the ampère-metre has a few turns of very large wire, which has a resistance of but a small fraction of an ohm.

In the instruments of Ayrton and Perry, the same mechanical action of the current is used; but the indicator is novel, and very ingeniously uses the axial twist, developed by longitudinal traction in a helix formed from a ribbon of highly-elastic material. A pointer attached to the end of the helix, or to a rod

in its axis, moves radially over a disk upon which is the graduation. The disk can be turned through a small arc for the adjustment of the zero. The instruments are very compact, simple, and strong, and very convenient in use; but the spring seems somewhat more likely to change than the simple spiral used by Kohlrausch.

Instead of the spring, Hopkins has proposed to use mercury confined in a capsule, the bottom of which is formed by an elastic diaphragm, upon which the iron core exerts a pull when the current passes. The capsule is filled with mercury, as is also a portion of a vertical glass tube inserted into it. The stress exerted upon the bottom of the capsule causes the mercury to fall in the tube, which may be provided with a scale, indicating current strength in the customary units. Various forms of apparatus recently described, involve the same or similar principles, using an iron rod floating in a cylinder partly filled with mercury, and an index-tube in which the mercury moves as displaced by the iron core, or having in the index-tube a lighter liquid for the purpose of increasing the range.

An entirely novel device has been employed by Lippmann. A horizontal tube, bent upward at the two ends, and partially filled with mercury, is placed between the poles of a strong magnet. By means of conducting-wires, the current is conveyed through the mercury in a vertical direction, at a point in the space between the poles of the magnet. The mercury, traversed by the current under the action of the magnet, is subject to a force which tends to move it laterally, thus changing the level in the two vertical arms, by an amount which is proportional to the intensity of the current. As the sensibility requires that the quicksilver column where traversed by the current should be very thin, this portion of the tube is given the form of a flat chamber only a fraction of a millimetre in thickness. If used for strong currents, the heating of the mercury would take place rapidly, and cause serious inconvenience. To avoid this would necessitate making the apparatus in much larger dimensions, with a loss of sensitiveness, or shortened range.

The rotation of the plane of polarization of a ray of light under the influence of an electrical current has been proposed as a means of measuring the current. Experiments, by a number of physicists, have shown that measurements may be made with considerable accuracy in this way; but as they all depend upon the determination of a plane of polarization, the device is found to be less convenient in its application than other methods.

We may notice in passing Cardew's volt-metre, in which the current is measured by the extension of a wire heated by it, an idea, which, though not new, has been applied to form a practical and useful instrument.

In all the instruments in which the current to be measured produces motion of a needle, or of a portion of the circuit, the action of external magnetic forces, whether of the earth, or of the machinery and circuits, as has already been noted, would be felt as soon as the sensitiveness of the instrument is pushed to the point required for great accuracy, and would make special provisions and precautions necessary. The spring instruments, as they utilize not the directive, but the attractive or repulsive action of the circuit, are almost entirely free from such disturbance, and are therefore better suited for those cases where time cannot be given to preliminary experiments for adjustment, and the determination of constants, or where it is desired to follow the changes of a rapidly varying current. It must be noted, moreever, as has been recently pointed out by Hospitalier, that where the changes in the current occur too rapidly, and especially in the case of intermittent or alternating currents, the self-induction in the coils of these instruments may give rise to considerable errors in their indications; and also that in all those cases where the effect to be measured depends upon the square of the current strength, instruments acting upon the principle of the dynamometer must be used to obtain trustworthy results.

ARTHUR W. WRIGHT.

INCANDESCENT LAMPS ON RAILWAYS.

FOR several months past, the Pennsylvania railroad company have been lighting nine of their cars with incandescent electric lamps. The electricity is produced by Brush storage batteries, which are charged once a week. The storage battery is carried underneath the cars in boxes built to receive them, — one-half being placed on each side. Each car requires six trays of four cells each. The trays are made so that the simple process of putting the trays in position completes the electric circuit. The battery when charged has an electro-motive force of forty-five volts; and, when the electro-motive force has fallen to thirty-nine volts, the battery is recharged. The batteries are charged at the depot in Jersey City by a sixteen-light Brush machine. In charging, the ordinary Brush manipulator, without the register, is employed.

Swan lamps consuming 1.1 ampères have been used almost exclusively, although Stanley-Thomson's lamps have been tried. The parlor-cars require ten sixteen-candle-power lamps, while the passenger-cars require but six. The lamps are all in parallel circuit, and so arranged that one-half may be used at a time. The wires are led through a clock mechanism, which registers the time they have been used. By an ingenious mechanical device, the clock is made to move half as fast when the switch throwing off half the lamps is turned.

Altogether, some seventeen batteries, of twenty-four cells each, are in use; and, as yet, only one cell has been disabled. As to loss of efficiency, due to deterioration, no tests have been made. Although the lamps are probably much less than sixteen-candle power, it is probable that their life is less than that of those used in buildings, because of the jarring to which they are subjected.

It is claimed that the cost of lighting the cars by the incandescent lamp compares favorably with that of lighting by compressed gas. During the heavy storms which prevailed during the first week of August, forty-eight cells of these storage batteries did the work on a telegraph-line which five hundred gravity-cells failed to accomplish.

CHLOROFORM AS AN ANAESTHETIC.

Experiments have shown that the vapor of thirty grams of chloroform, mixed with a hundred litres of air, will kill a dog in a few minutes; while a dose three times as strong, if diluted with a cubic metre of air, produces a sleep without danger, lasting two hours. The tension of the vapor, rather than the quantity, determines the effect; but the operator, in administering the anaesthetic, has to take into account the quantity: so that, under apparently the same conditions, very different results are obtained; and hence arises the difference of opinion among surgeons as to its use. Six grams in a hundred litres of air have very little effect upon a dog; ten grams produce insensibility for an hour and a half; while fourteen grams cause death in forty-five minutes, and twenty grams in five minutes. In the case of man, with an inspiration of half a litre, these results are produced by three, five, seven, and ten centigrams of chloroform respectively. It will be seen that the difference between the harmless and the dangerous proportions is very slight. Accordingly, the use of chloroform has always been considered dangerous; and, in order to make it less so, Mr. Paul Bert has made experiments upon animals, and afterwards applied them to man. His experiments with man have extended over two hundred cases, including patients of all kinds of temperaments, with always the same result. He uses ten grams of chloroform vaporized in a hundred litres of air, — a dose agreeable to some, and to none disagreeable. The most disagreeable effects of the anaesthetic have always been felt in the period of repulsion; but Mr. Bert almost entirely removes this. The period of excitement is not great, and only lasts from one to two minutes; while in the case of more than one-third of the adults it is entirely absent. The pulse is a little accelerated during the period of excitement, but remains perfectly normal and regular during sleep. Complete insensibility is produced in from six to eight minutes, and is maintained during the whole time of respiration. After the patient becomes insensible, the quantity of chloroform is reduced to eight grams, and later to six. Painful operations have no effect, except that the respiratory movements are slightly accelerated. There is no nauseation, and the amount of chloroform administered is not enough to cause poisoning; while there is no fear of asphyxia, for the amount of oxygen is reduced only by a hundredth. Indeed, with the exception of cerebral congestion and faintings, none of the ordinary dangers need be feared.

Condensed from *La nature*.

VAN ERMENGEM ON THE CHOLERA MICROBE.

Some months ago we spoke of Van Ermengem's results in investigating the cholera bacillus, and promised to refer to them again. His completed report, as presented to the Belgian minister of the interior, with additions in the way of notes and plates, makes a volume of some three hundred and sixty pages. As it is the most complete summary yet published of this much-vexed question — the relation of Koch's comma bacillus to cholera — we have thought it worth more than a passing notice. Commissioned by the government, Dr. Van Ermengem obtained material, and made observations upon the bacillus in Paris, Berlin, Marseilles, during the epidemic of the last year, and in his own laboratory at Brussels.

The report is divided into three sections, the first of which treats of his expedition to Paris, Berlin, and Marseilles, and the work which he did there; the second gives the results of his investigations; and in the third he discusses the consequences of this discovery of the comma bacillus.

First visiting Paris, the author saw Dr. Roux in Pasteur's laboratory, and obtained specimens from him, prepared under Koch's supervision at Toulon; from this place he went to Marseilles, where he was able to work with Nicati and Rietsch, and pursued his investigations until he was certain of the constant occurrence of the curved bacillus in Asiatic cholera, and until he had obtained sufficient material with which to pursue the study of the micro-organism in his own laboratory. To make doubly sure that he was working with the right thing, he went to Berlin, and showed his cultures and microscopic preparations to Koch himself.

The morphology of the cholera microbe is most exhaustively treated. Its curved shape is, of course, its most striking characteristic; and the author declares his belief that no other organism possessing all its peculiarities has been found. The method of preparation for the microscope is the usual one of Weigert Koch, and the organisms seem to have no special affinity for any coloring-material. Gram's method gives good results; and, in sections, the author prefers watery solutions of methylene blue, or methyl violet 5 B. Left in either of these solutions for from one to two

Recherches sur le microbe du choléra Asiatique. Rapport présenté à M. le ministre de l'intérieur le 3 novembre, 1884. Par le Dr. E. Van Ermengem, augmenté de nombreuses notes et orné de douze planches photographiques, reproduisant vingt-quatre microphotographies originales. Paris, *Bruxelles*, 1885. 8°.

hours at 50° C, or twelve hours at the temperature of the air, and washed for a minute or two in absolute alcohol slightly acidulated with hydrochloric acid, the staining will be found to be perfect. Then follows a long description of the varying appearances of the organism when grown in the intestine, in gelatine, or on agar-agar, on coagulated serum, or in many nutrient fluids, which, although exceedingly interesting and important, is too long to be given here.

The movements of the cholera bacillus are very active, and are much influenced by the temperature, ceasing almost entirely at 16° C. They are best studied in bouillon, or liquid serum, on a warm stage. When the organism stops, there appear currents in the nutrient fluid at both ends, which seem to indicate the existence of one or more cilia. Then follows an exhaustive discussion of the various culture media, and the behavior of the cholera bacillus in them; and, by cultivations upon coagulated serum, the aërobic nature of these bacteria seems to be settled.

The rapidity of development, and the influence upon it of temperature, oxygen, and of various chemicals, are discussed at length. Cultures in gelatine, exposed to a freezing temperature for twelve days, grew at 20°–25° C.; and cultures in bouillon were completely sterilized after two hours' exposure to 50°–55° C. Corrosive sublimate (one part to sixty thousand of water) was destructive in half an hour to the vitality of cultures of these organisms in chicken bouillon.

The author considers that the researches made thus far prove the constant and exclusive existence of Koch's bacillus in cholera asiatica, and quotes many observers in support of this conclusion. Inoculation experiments with the bacillus under investigation, and control experiments of various kinds, were made, and are detailed at great length, all tending to show the specific nature of the bacillus.

A long discussion of the critics of Koch then follows; and the fallacies in the assertions of Strauss and Roux, Lewis, Treille, Hericourt, Finkler and Prior, and Emmerich, are exposed. The assertions of Finkler and Prior are combated at length, being the most important; and the now well-known methods of distinguishing between the organism discovered by them and that of Koch are given. [We believe that Finkler withdraws his claim of identity, and now considers the comma bacillus of cholera nostras to be only a sort of first-cousin to that of cholera asiatica. — ED.] The consequences of the discovery of Koch's bacillus are well placed before us, and, its specific nature being granted, are worthy of the closest attention.

The most important part of the work is the study of the action of various germicides upon this bacterium. These are divided into two classes, physical and chemical; of the former, desiccation stands first in point of usefulness, and ease of application; then comes dry, and, lastly, moist heat. Of the latter, chlorine, bromine, and other gases, and various disinfecting liquids, are studied, and their action compared. Here, as in the case of other bacteria, corrosive sublimate stands at the head for destructive activity; but, owing to its poisonous properties, its use is recommended to be restricted to the disinfection of the hands, vessels, etc.; where large quantities of fluid are needed, as in the treatment of the dejecta, outhouses, etc., a five-per-cent solution of phenic acid is preferred.

The report closes with a very valuable summary of the methods of disinfection, and the strength of the solutions to be employed. Something is also said of Ferran's experiments; but these have been conducted with so much secrecy, and upon so strictly a commercial basis, that they are unworthy of attention. A number of plates accompany the report, and add to its value. Taken as a whole, the work is a credit to the author, and to the government which commissioned him to perform it, and furnishes, as far as one man can, complete confirmatory evidence of Koch's assertions in regard to the comma bacillus of cholera.

THE FIRST REPORT OF THE AMERICAN SOCIETY FOR PSYCHICAL RESEARCH.

THE portion of the public that is eager for marvellous so-called 'results,' will quickly lay down this pamphlet in disgust. The first announcements and circulars of the new society are here printed together; and the chief outcome, so far, is contained in the appendix B: "Discussion of the returns in response to circular No. 4," by Prof. James M. Peirce and Prof. E. C. Pickering. And here, in the words of the committee on thought-transference in their general report, the "general result is, at present, unfavorable to thought-transference as a power belonging to mankind in general. The number of the experiments is, moreover, sufficient to cover pretty satisfactorily the particular line of inquiry which suggested them." The committee have there-

fore now recommended, in circular No. 5, an investigation of possible thought-transference in case of the ideas of geometrical forms, the first set of experiments reported on in appendix B having especially dealt with conceptions of number and color.

'Results,' we say, the sensation-seeking public cannot just yet find. But then the word 'results,' as we here quote it, is not identical in meaning with what science usually calls results. For many people, psychical research is nothing, unless it finds wonders; and by 'results' such people mean something to marvel at. But psychology is *not* concerned to find marvels; and the negative outcome of these experiments, as thus far developed, is neither disappointing nor fruitless. The existence of thought-transference of some sort has, indeed, so far been neither proved nor disproved by the work of the society. And, as was known at the outset, the range within which thought-transference can noticeably operate, has long been shown by the practical tests of daily business and social life to be at least a decidedly limited range; since, as a fact, we find it constantly possible to keep important secrets of all common sorts from curious intruders by the simple device of strict silence concerning them. Yet even the negative answer of the experiments is, so far as it goes, already a valuable answer; and, most important of all, the lines of experiment now begun already promise to prove frutiful beyond the range of the direct discussion of thought-transference.

As is shown in the report on the answers to circular No. 4, the effort to discover the existence of thought-transference in case of the number-concepts has led to the observation of certain tendencies in the mind of at least one 'percipient,' to follow certain systems of association in giving his numbers. Minute as seems at first sight the importance of such observations, it is out of just such facts that fruitful generalizations have grown elsewhere in the sciences of experience; and so it may be here. In fact, if we may venture a guess as to the future, it would be the very presumptuous conjecture, that the society may find its search for thought-transference, and for other phenomena of the mental El Dorado, as that region is now popularly conceived, a search in the end somewhat like the well-known quest upon which Saul went, just before he found his kingdom. In short, — guesses about the future results aside, — there is so much to be done for the theoretical and practical needs of psychology, so much experimental research necessary for the formation of a science that may yet have vast influence upon the art of education, upon the treatment of the insane, and upon the policy of society towards criminals, that all experimental beginnings of such a science in any direction must be greeted with satisfaction. If thought-transference is in any mental region a fact, we shall rejoice to find it; but, if these investigations render it less probable rather than more so, they are still certain, under their present, cautious, and yet highly liberal management, to lead to other psychological discoveries that will be worth far more, very possibly, than the ones first sought. Let us hope that the members and the public will recognize more and more, as time goes on, the wisdom that led the earliest founders of the society to define its object broadly as "the systematic study of the laws of mental action." In this programme there is no sign of any unscientific limitation of work to the 'uncommon' or 'marvellous,' or 'little recognized,' phenomena of mind; although these too, when one meets with them, are to be cordially welcomed. But the society simply starts out to do scientific work without prejudice, and with scientific co-operation and patience. This first number is of course confined in its range of work; but the co-operation is well shown, and the patience in the discussion of the least exciting details is noteworthy and deeply instructive.

In addition to the mentioned papers, we find in appendix C a discussion of the "Possibility of errors in scientific researches, due to thought-transference," by Prof. E. C. Pickering. This paper treats of a test offered by the systematic observations on the magnitudes of the stars, for determining the existence or non-existence of thought-transference between the recorder and the observer. The result of the special application of this method to observations made at Cambridge, is, for the present, negative; but further application is promised. The whole pamphlet is unassuming, clearly written, and, to any sober student, helpful.

ATLAS OF PLANT-DISEASES.

The first number of this work, by Dr. Zimmermann, consists of two folio plates, with thirty micro-photographs of different stages of three common species of Puccinia, together with a short notice of fungi, as the cause of diseases on plants, with special reference to the Uredineae. The text is well adapted to the

Atlas der pflanzenkrankheiten welche durch pilze hevorgerufen werden. By Dr. O. E. R. Zimmermann. Halle, 1885.

wants of gardeners, agriculturists, and amateurs, for whom it is intended; but it may well be questioned whether the photographs convey so good an idea of the subject as can be obtained from the almost numberless wood-cuts, and other illustrations in the text-books of plant-diseases. Naturally, the best figures are those which represent the teleutospores; but even these are no better than most of the wood-cuts with which the botanical public is already sufficiently familiar; and the figures giving the gross appearances of the fungi, both in their uredo and aecidial conditions, are almost worthless, although the original preparations were evidently excellent. However valuable photography may be in representing minute forms like bacteria, or certain structures which can be seen with very low powers, it is evidently not adapted to those plants which, like ordinary moulds, rusts, etc., require a moderately high power. The execution of the plates of the atlas is as good as that of any similar work which we have seen; but, judging by the result, it would seem to be better to abandon photography altogether in such cases.

NOTES AND NEWS.

— THE Kongo conference makes its appearance in all the geographical periodicals, generally accompanied by a map of greater or less value. We shall ourselves publish a map in our next issue. Besides innumerable lectures and addresses, the republication of the conclusions of the international commission has been made by nearly every geographical periodical of note. Karl Winter of Heidelberg has just issued a neat pamphlet of a hundred and twenty pages, in which the history and final agreement, forming one of the most remarkable results of modern civilization, are set forth clearly and briefly by C. A. Patzig, with the title, 'Die afrikanische konferenz und der Congostaat.'

— The mittheilungen of the Vereins für erdkunde zu Halle an der Saale for 1884 is largely devoted to Thuringia. Rackwitz has an anthropological article illustrated by an interesting chart of the distribution of antiquities, customs, boundaries of dialect, etc.; Reischel, a discussion on the orohydrography of the central Thuringian basin; Edler discourses on sun-spots; and David Brauns furnishes an interesting paper on the distribution of vertebrates in Japan.

— The Argentine expeditions into Patagonia have raised the credit of that country, which has long been supposed arid and sterile. The report of Gen. Villejas, and that of Col. Roa who has travelled more than five hundred leagues in Patagonia, affirm that the region near the base of the mountains is rich, not only in metals and minerals, but in fertile valleys which nestle between spurs of the range. With steam-transportation between the mountains and the coast, it is affirmed that rapid growth of population might be expected, and prosperous communities be established.

— The expedition of Dr. Bunge of the Lena international station had not been heard from for some time, and some anxiety was felt for its safety. A recent telegram announces its safe arrival at Yakutsk.

— Sibiriakoff, the wealthy Russian merchant, well known as the friend and patron of Nordenskiöld, has himself made an interesting journey during the summer of 1884. The details of it are only now made public, as news travels slowly in those regions. He ascended the Petchora to Oranets, then crossed the Ural to the Sigva or Whitefish River, which joins the Sosva, an affluent of the Obi. The traveller reached Shikurik Sept. 21, and Tobolsk Oct. 18. It is demonstrated by this journey, that a trade route by which goods can be carried in summer is practically open in this direction, a matter of great commercial importance to Siberia.

— J. Chaffaujon has been engaged in exploring the region of the Orinoco, and has already rectified many errors of the charts of its course. He has started from Bolivar, Venezuela, on another journey, which is expected to take him into unknown districts of its head-waters.

— A work interesting to the philologist, geographer, and anthropologist, is that of l'abbé Pierre Bouche on the slave coast and Dahomey. The author spent seven years among the black barbarians of this region, and became familiar with their vices and virtues. It is furnished with a map, and issued by Plon at Paris. The same firm are publishing a large number of geographical or partly geographical works at very modest prices. Among these may be noted a translation of Gilder's 'Rodgers' expedition,' Clapin's 'Le Canada,' and Count Raymond de Dalnias' 'Les Japonais,' which has had a very favorable reception. A life of François Garnier, the French Cortez of Annam, has been published by Dreyfous. Recent events in Tonkin have recalled his marvellous career and romantic death, which, embodied in a novel, would have been criticised as too improbable for literary art.

— Further particulars of the fate of the African explorer, Richard Boehm, have been received in Germany. He died of fever, caused by over-anxiety and fatigue, on the 27th of March, 1884. His camp was in southern Urna, — three days' journey from Lake Upamba, recently discovered by him and Reichardt. After the death of his companion, Reichardt tried to go on alone to the sources of the Lualaba, but was obliged finally to fight his way back. The letter just received from him is dated from Karema on Feb. 20 of this year.

— A telegram received at Berlin from Alexandria announces that the African travellers, Dr. Juncker and Casati, have arrived at Lado, an Egyptian mili-

tary station on the Bahr-el-Jebel. The travellers were engaged in exploring the Nyam-Nyam district, between the tributaries of the Nile and the Upper Kongo. Nothing had been heard of them for a long time, and it was feared that the Mahdi had cut off their retreat.

— The exhibition of metal-work at Nuremberg was opened on the 15th of June. The Japanese exhibits arrived late, in over fifty packing-cases.

— A new exhibition was opened in Paris July 26: it is called the Exhibition of industry, and presents some analogy to the English inventions. It will remain open till the 23d of November. It is to be held at the Palais de l'industrie; and, naturally, electrical matters will be of primary interest. The commissioner-general of the undertaking is Mr. de Redon; and the committee includes some well-known names, such as those of Lemonnier, Tarraut, Milde, Boistel, de Meritens, Cance, etc. Electricians, in fact, form a considerable majority.

— *Nature* states that the third session of the International geological congress, which was postponed last year on account of the cholera on the continent, is fixed to be held this year on Sept. 28, at Berlin, under the honorary presidency of the veteran geologist of Rhineland, Dr. H. von Dechen. The president of the organizing committee is Professor Beyrich; and the general secretary, M. Hauchecorne, 44, Invalidenstrasse, Berlin.

— The New-York *Evening post* publishes the following: I just learn from a newspaper that the commission which investigated the Coast-survey reflected upon me in their report as follows: "That for several years, beginning in 1873, C. S. Peirce, assistant, has been making experimental researches with pendulums, without restriction or limitation as to times and places; that since 1879, expenditures on account of those experiments, aside from salaries of chiefs and assistants, amount to about $31,000; that the meagre value of those experiments to the bureau have been substantially destroyed." I have immediately addressed a letter to the secretary of the treasury, of which the following is the substance: 1°. My expenditures, aside from compensation of myself and my assistants, during the period specified, have not amounted to one-third of the sum named; and I appeal to the secretary to ascertain this by the addition of the amounts of my original accounts now on file in the department. 2°. All my operations have been carried on under specific instructions, and therefore have not been "without restriction or limitation as to times and places." I ask to be informed what operation does not appear to be covered by instructions on file in the office, and promise to show, in any instance, that it really is so covered. 3°. No records have been destroyed. 4°. I maintain the value of determinations of gravity in general, and the excellence of mine in particular. 5°. I tender my resignation if the opinion expressed as to the meagre value of my services is accepted by the department. Until my letter is acted upon, it might perhaps be considered a breach of official etiquette for me to make it public; but I wish you, as a friend and scientific man, to know that I have a defence against the accusations made. C. S. PEIRCE.

Ann Arbor, Mich., Aug. 10.

— The *Romaji zasshi* is a journal recently established in Japan, with the object of introducing the use of the Roman alphabet to spell phonetically the Japanese words. The journal is partially supported by the government, and is the official organ of a society of some forty-two hundred members, which aims to do away with the Chinese characters in Japanese literature.

— A late report upon the Cambridge (Eng.) local lectures, by Mr. Roberts, contains (says the London *Graphic*) an interesting story of the pursuit of scientific knowledge under difficulties. Two miners at Backworth, in Northumberland, in order to attend a course of lectures on chemistry at Cramlington, five miles off, walked after their day's work to that place and back in order to attend every lecture. They made sufficient notes to enable them on each occasion to retail what they had heard to a class formed by them at Backworth, and actually repeated the experiments, so far as rough apparatus and their means would allow. The lecturer visited this little class (there were only seven in all), and found upon examining them that they had acquired a sound knowledge of the first steps in chemistry. This germ has now blossomed into 'The Backworth students' association,' consisting entirely of miners. It is not often that such a splendid instance of self-help is offered for our admiration, and, we may add, imitation.

— The death of the distinguished zoölogist, Henri Milne-Edwards, so long connected with the Paris museum, is announced to have occurred on July 29 last. He was a Belgian by birth, and spoke English fluently. His son Alphonse has been, in recent years, almost as well known, his father's age (he was born in 1800) preventing much literary activity.

— We learn from *Nature*, that, on July 10, at about noon, a wonderful mirage was seen on Lake Wettern, in Sweden, by a number of people between the villages of Fogelsta and Vadstena. A small island in the lake appeared as if covered with the most gorgeous flora, and tall gigantic trees, forming great groves, between which buildings having the appearance of the most splendid palaces were seen. The Sandö, another little island, seemed to rise out of the sea many times its actual height, its sandy shores looking like lofty castellated walls. It had the exact appearance of a mediaeval fortress enclosed by four walls. Two other little islands, Åholmen and Risön, appeared also as lofty towers above the water. The mirage lasted for nearly half an hour, when it disappeared somewhat rapidly.

— Inspired, apparently, by the success of Marvin's 'Russians at the gates of Herat,' Mr. Archibald Ross Colquhoun — the author of 'Across Chrysê,' and special correspondent of the London *Times* in China — has written a little book of fifty-eight pages on Bur-

ma and the Burmans, or 'The best unopened market of the world' (London: Field & Tuer). The late massacres in Mandelay, the capital of independent Burma, have drawn public attention to that part of the globe which the recent actions of the French in Tonquin and southern China have not tended to allay. Probably no one is better qualified by actual observation for his task than Mr. Colquhoun; and this readable essay, with its map and statistical table, should receive the careful consideration of all who are interested in what may at any day become the farthest eastern question.

— The Ann-Arbor meeting of the American association opens Aug. 25, and closes Sept. 1, not Sept. 10 as erroneously stated in some of the circulars.

— The special association train will leave Buffalo at six A.M., Aug. 25, will stop three hours at Niagara Falls, and arrive in Ann Arbor at 8.23 P.M.

— The Fitchburg railroad requests us to announce that tickets to Ann Arbor and return, by the Hoosac-tunnel line, will be sold at reduced rates.

— The *Annuaire géologique universel et guide du géologue* is the title of a projected annual, of which the first volume has lately been received. It is edited by Dr. Dagincourt of the 'Comptoir géologique de Paris,' and contains articles on a number of different countries by competent geologists. The chief object of the work, as stated in the preface, is to give lists of the geologists of various countries, so as to increase the range of professional acquaintance; to indicate to the tourist the principal collections and localities that he should visit, and to record the annual progress of each nation. Only three months of preparation have been spent on the first volume; its publication having been hurried, that it might appear before the meeting of the geological congress at Berlin in September, and that it might give rise to criticism from which the editor hopes to profit. The materials thus collected embrace brief geological sketches of several countries, North America being treated by de Margerie of Paris; accounts of official surveys, publications, and maps; lists of societies and local geologists, and of universities and museums; notes on recent geological works. This programme is by no means uniformly carried out: uniformity in execution would be a manifest improvement. The printing is not done with sufficient care; and, in the list of addresses, the errors are seriously numerous.

— Mr. Clement L. Wragge is arranging, says *Nature*, for the establishment of a meteorological station in northern Queensland and New Guinea. He hopes to establish an observing station at Port Moresby. An assistant will carry on the work of the Torrens observatory. Mr. Wragge is also arranging for the continuance of his observatory on Mount Lofty.

— Two important papers have lately appeared on the reddish corona around the sun, — one by Kiessling of Hamburg, who has already given the best statement of the optical process by which the ring is formed; the other by Forel of Morges, Switzerland, who has suggested that the corona be called 'Bishop's ring,' after its earliest observer, the Rev. Sereno F. Bishop of Honolulu, who noted it on Sept. 5, 1883. The recent papers are concerned with the extension of the area of first visibility; and both writers conclude that there is no question of the connection of the ring with the famous sunsets, or of the origin of both of these remarkable phenomena in the dust thrown out from Krakatoa. Kiessling quotes with approval the name suggested by Arcimis of Madrid, 'Corona solar krakatoense.' The need of observations, especially at elevated stations, to determine the duration of the ring's appearance, is emphasized. Mount Washington and Pike's Peak should afford good records.

— On Tuesday morning, July 14, an earthquake occurred in eastern and central Bengal which, according to *Nature*, is said to have been the severest one experienced by the inhabitants for forty years. The shocks lasted for nearly a minute. In Calcutta, the houses rocked and cracked, and the plaster fell in large quantities. There was general consternation, the people all rushing out of doors. A wave was raised in the river like a bore, causing some anxiety with respect to the shipping. Luckily no accident occurred, and no damage was done beyond the cracking of the walls of some old houses; but, had the shocks lasted some seconds longer, the city would probably have been laid in ruins. Some of the up-country stations were less fortunate. At Serajgunge, a chimney belonging to some jute-mills fell. In many other places some of the houses fell, and people were killed. Twenty-five deaths are reported to have occurred at Aheripore, five at Bogara, eleven at Azimgunge, and several at Dacca. The following morning another shock was felt in Cashmere, which did some injury. According to the latest reports, the earthquake caused altogether seventy deaths in Bengal.

— Tuttle's comet of 1858 was seen at Nice on Aug. 9. Johannes Rahts, a german computer, has calculated an orbit from the observations made at the 1858 and 1871–72 appearances, with the perturbations of the principal planets included. His ephemeris agrees with the place in which the comet was found within fifteen seconds of time, and about six minutes of arc; so that, by pointing the telescope to the computed place, the comet would be in the field of view after an absence of nearly fourteen years. Using his elements, the perihelion distance of the comet is ninety-five million miles, and the aphelion distance nine hundred and sixty-seven million, the period being 13.76 years. According to these data, the comet, at its nearest approach to the sun, is at about the same distance as the earth, and, at its farthest distance, it is about a hundred million miles beyond the orbit of Saturn. It will slowly approach the earth and its light increase during the present month, its distance at time of discovery being a hundred and seventy-five million miles. It will not, however, become visible to the naked eye. This is one of five comets discovered by Mr. H. P. Tuttle at Harvard college observatory, two others besides this having been discovered in 1858.

— *Nature*, for Aug. 6, in its leading article, quotes with approval, and re-enforces with new arguments, the claim which *Science* made last February, that great saving could be effected upon the introduction of prime-meridian time suggested by the Washington conference, by the virtual amalgamation of the nautical almanacs now published separately by each of the maritime nations, and commends our suggestion that the money thus saved should be expended upon an international mountain observatory. The same number contains a long article on the coordination of the scientific bureaus of our government, based upon the two schemes proposed by the committee of the national academy, and by Major Powell, which appeared some time since in *Science*. The article on the Lick observatory, which we published last June, is also given in full. We shall shortly print another, with illustrations.

— Another exhibition, to be held in New Orleans, is proposed for next winter.

— A short time before his death, Prof. H. R. Göppert of Breslau, in connection with the chemist Professor Poleck, made a study of the Hausschwamm, — a fungus commonly known with us as dry-rot, which had caused great injury to buildings in northern Germany. The results of their combined studies now appear in a pamphlet by Professor Poleck (Der hausschwamm, Breslau, 1885). The dry-rot, Merulius lacrimans, seems to be unknown in a wild state in Germany, but is confined to wood-work of different kinds, and attacks by preference, coniferous timber. Strange to say, the fungus does not usually infest old structures, but generally makes its appearance in comparatively new buildings; and a startling series of figures shows the amount of damage done in the region of Breslau. Chemical analyses by Poleck show that the merulius is particularly rich in nitrogenous compounds and fat, which is rather remarkable, when one considers the chemical constituents of the timber on which it grows. Injury to health, or even death, is said to result from exposure to air containing large quantities of the spores of the merulius; and several authenticated cases are reported. In a supplementary note, Poleck considers the relationship of merulius to actinomyces, a fungus which causes a characteristic disease in man and cattle; and he apparently comes to the conclusion that what is called actinomyces is probably only the merulius altered by the peculiar matrix on which it is growing. His statements on this point can hardly be called conclusive, or, in fact, other than vague.

— An interesting new limuloid crustacean from the Upper Chemung of Erie county, Penn., is described in the *American journal of science*, under the provisional generic name of Prestwichia. It occurs at the junction between a bluish sandstone and a soft fine shale, which, in the process of weathering, has worn away, leaving a sharply defined cast in hard sandstone.

— In Vallorbes, in Switzerland, there are several important fish-cultural stations for the development of trout, the chief of which are on the borders of Lake Neuchâtel. From 1864 to 1870 the station at Poissine has placed in the neighborhood of 450,000 young fry in the rivers, and from 1872 down to the present time more than 1,000,000. By this means the rivers have been restocked in a very satisfactory manner, and the trout of Vallorbes are far-famed. This total would have been much larger had it been possible to secure the required number of eggs. In 1885, 74,000 fry were developed; the eggs being placed in the incubating cans from the 10th to the 20th of April, and in the stream, between the 20th and 31st of May, according to the rapidity of development.

— The industry of gutta-percha production, which has been so profoundly menaced by the vast destruction of the trees by the natives, is likely to be greatly increased in importance by the discovery of Mr. Edward Heckel, recently published in *La nature*. Dr. Heckel has announced that there is a tree in central Africa, Butyrospermum Parkii, called by the natives 'karité' or 'caré,' which is likely to replace the gutta tree. The berries of this tree produce a stearic wax called 'butter of karité,' and valued highly by the natives and travellers. The tree covers the vast tropical area of central Africa in dense forests; and, after it has attained the age of four years, it is possible by discrete incision to obtain from its trunk and larger branches an annual supply of four kilogrammes of gutta ($5–6 per year at the present price) without injuring the tree in the least. By reason of the great facility with which this tree grows in all kinds of soil, and because of the success attending its cultivation in a few places, Mr. Heckel thinks that it can be profitably transplanted into the English and French colonies. Guided by botanical analogy, he also suggests it as highly probable that the Indian species of Bassia will give a product similar to that of the karité of Africa.

— By a congratulatory letter addressed to him by the society upon the occasion, Professor Asa Gray was recently reminded that fifty years have elapsed since he was elected a member of the oldest natural-history society in Germany, the imperial Academia leopoldino-carolina naturae curiosorum.

— Dr. A. W. Ljungman has been granted by the Swedish government the sum of 350*l.*, in addition to his salary, for investigating the herring and the herring fishery on the south-west coast of Sweden.

— The twelfth number of the German *Colonialzeitung* contains an article by Herman Soyaux on experimental cultivation in tropical Africa. He maintains that the soil is suitable for agriculture, though it is exhausted in a year by the cultivation of maize and manise: he recommends the cultivation of coffee, vanilla, India rubber, tobacco, cotton, and sugar-cane according to the varieties of soil. Lieut. de Gile, commander of the Upper Kongo division, has published a most enthusiastic description of the country, where nearly all the above-mentioned plants, and many others, grow naturally, or are already cultivated. He represents the climate as healthy, and the country thickly populated.